ATEX SOLUTIONS FROM AERZEN
Rotary Lobe Blowers, Rotary Lobe Compressors and Screw Compressors
in accordance with Directive 94/9/EC
Directive 94/9/EC increasingly finds application in chemical and process technology industries ranging from the chemical to process technology. It became law on December 12, 1996; see also the eleventh regulation of the product safety law (explosion protection regulation). Beside the absolute top priority of safety and consumer protection, standardizing the requirements across Europe will help the free exchange of goods within the EU. It is increasingly important that manufacturers make this clear to their customers prior to selecting the equipment: explosion protection has to be planned for in advance.

Two Directives – a Single EU-wide Protection Approach.

- ATEX Product Directive 94/9/EC (ATEX 95)
- ATEX Worker Protection Directive 1999/92/EC (ATEX 137)

The ATEX Product Directive 94/9/EC regulates the commercialization of products intended for use in explosion endangered areas. The primary goal of the product directive is to protect persons who work in explosion-prone areas or in areas that could be affected by explosions. Since the end of 1996 only those devices, components and protective systems that comply with ATEX Product Directive 94/9/EC may be commercialized for use in areas with risk of explosion.

By comparison, the ATEX Worker Protection Directive requires that employers (plant management) fulfill or comply with certain requirements pertaining to the health protection and safety of employees who are exposed to potentially explosive atmospheres. Plant managers are required to include an explosion protection plan as part of their risk assessment and to divide areas with potentially explosive atmospheres into zones.
The Ex-Design You Need.

AERZEN rotary lobe blowers, rotary lobe compressors and screw compressors are considered “Equipment” according to Directive 94/9/EC. All AERZEN machines, components, and protective systems fall under Equipment Group II (trade, industry). They are divided into three categories, depending on their application. Following information is important for us when designing machines to completely satisfy your safety requirements:

**Equipment Categories 1 to 3.**

<table>
<thead>
<tr>
<th>Equipment category according to EC directive</th>
<th>Category 1</th>
<th>Category 2</th>
<th>Category 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazard</td>
<td>Constant, frequent, or over longer periods (&gt; 1000 h per year)</td>
<td>Occasional, random (&lt; 10 to 1000 h per year)</td>
<td>Infrequent and short-lived (&lt; 10 h per year)</td>
</tr>
<tr>
<td>Safety level</td>
<td>Very high</td>
<td>High</td>
<td>Normal</td>
</tr>
<tr>
<td>Zone designation</td>
<td>Zone 0</td>
<td>Zone 20</td>
<td>Zone 1</td>
</tr>
<tr>
<td>Zone 21</td>
<td>Zone 2</td>
<td>Zone 22</td>
<td>Zone 2</td>
</tr>
<tr>
<td>Zone 22</td>
<td>Ex-Atmosphere</td>
<td>G (gas)</td>
<td>G (gas)</td>
</tr>
<tr>
<td>G (gas)</td>
<td>D (dust)</td>
<td>D (dust)</td>
<td>D (dust)</td>
</tr>
</tbody>
</table>

**Dust or Gas: the Ex-atmosphere.**

- permanent hazard
- hazardous conditions during normal operation
- hazardous conditions limited to system failure (temporary)

**The explosion triangle**

- Ignition source
- Oxygen
- Flammable material

ATEX is a contraction of the French “ATmosphère EXplosible” and is used for the European directive covering equipment and protective systems used in areas with a risk for explosions.
# Explosion Groups and Temperature Classes

<table>
<thead>
<tr>
<th>Temperature classes</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
<th>T4</th>
<th>T5</th>
<th>T6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ignition range of the explosive mixture</td>
<td>300° C – 450° C</td>
<td>200° C – 300° C</td>
<td>135° C – 200° C</td>
<td>100° C – 135° C</td>
<td>85° C – 100° C</td>
<td></td>
</tr>
<tr>
<td>Max. surface temperature*</td>
<td>450° C</td>
<td>300° C</td>
<td>200° C</td>
<td>135° C</td>
<td>100° C</td>
<td>85° C</td>
</tr>
</tbody>
</table>

**Explosion groups for gases**

- **I** Methane
- **II A** Acetone, ammonia, methane, methanol, propane, toluene
  - Ethyl alcohol, n-butane
  - Diesel, gasoline
  - Acetaldehyde, diethyl ether
- **II B** Communal gas (Coal gas)
  - Ethylene
  - Hydrogen sulfide
- **II C** Hydrogen
  - Acetylene
  - Carbon disulfide

**Explosion groups for dust**

- **III A** Flammable lint
- **III B** Non-conductive dust > 10³ Ω
  - => el. equipment must be protected to at least IP 5x
- **III C** Conductive dust < 10³ Ω
  - => el. equipment must be protected to at least IP 6x
  - => the requirements of the next higher zone apply (Zone 22 becomes Zone 21)

* Defined by how the equipment or equipment components are to be used

---

Each plant component will be certified. In addition, AERZEN discharge silencers base plates are certified as spark arresters by TÜV Nord.
Typical Labelling in Accordance with Directive 94/9/EC.
(ATEX)

<table>
<thead>
<tr>
<th>Ex-label</th>
<th>For prevention of explosions (hexagon symbol)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment group</td>
<td>I = Mining</td>
</tr>
<tr>
<td></td>
<td>II = Trade and Industry</td>
</tr>
<tr>
<td>Equipment category</td>
<td>1 = Very high safety level</td>
</tr>
<tr>
<td></td>
<td>2 = High safety level</td>
</tr>
<tr>
<td></td>
<td>3 = Normal safety level</td>
</tr>
<tr>
<td>Internal/external</td>
<td>i = Internal</td>
</tr>
<tr>
<td>explosive atmosphere</td>
<td>o = External</td>
</tr>
<tr>
<td>Ex-atmosphere</td>
<td>G = Gas</td>
</tr>
<tr>
<td></td>
<td>D = Dust</td>
</tr>
<tr>
<td>European norm EN</td>
<td></td>
</tr>
<tr>
<td>Ignition protection type</td>
<td>c = constructive safety</td>
</tr>
<tr>
<td>Temperature class</td>
<td>T1, T2, T3, T4, T5, T6</td>
</tr>
</tbody>
</table>

\[ \text{Ex-Illustration} \]

\[ \text{Ex-label} \]
INDUSTRIES AND TYPICAL APPLICATIONS.

Environmental technology
- Biogas compression
- Natural gas compression
- Gas feed

Food and plastics industries
- Pneumatic conveying
- Silo loading and unloading

Chemical and pharmaceutical industries
- Gas conveying
- Degasification

Refineries

Power plants
MADE BY AERZEN. EFFICIENCY AND MAXIMUM SAFETY IN ALL ZONES.

Compressors and blower units “made by AERZEN” have always been used in highly critical areas. The knowhow and experience that we have gathered over the decades in almost all types of application are reflected especially in the processes that fall under the ATEX directive. The range of solutions that AERZEN can offer you for virtually all ATEX zones is unique in its scope and effectiveness: a good starting point for you when it comes to meeting ever more stringent requirements, safely and economically.

Your Requirements:
Sound advice is the key to success. This is especially true when planning for applications in Ex-areas. This is why we place great emphasis on careful preparation. Our engineers will discuss with you well in advance the details of your project and bring together all ATEX-relevant information (further details on page 3). That is the prerequisite for designing the right equipment for each application in accordance with ATEX zone requirements.

Remarkably diverse: the ATEX portfolio from AERZEN.

<table>
<thead>
<tr>
<th>Positive pressures</th>
<th>ATEX equipment</th>
<th>Internal Ex-atmosphere (intake from Ex-zone)</th>
<th>External Ex-atmosphere (Ex-free intake)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>21</td>
</tr>
<tr>
<td>Delta Blower</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Delta Hybrid</td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Delta Screw</td>
<td></td>
<td></td>
<td>x</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Negative pressures</th>
<th>ATEX equipment</th>
<th>Internal Ex-atmosphere (intake from Ex-zone)</th>
<th>External Ex-atmosphere (Ex-free intake)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>21</td>
</tr>
<tr>
<td>Delta Blower</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Delta Hybrid</td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Delta Screw</td>
<td></td>
<td></td>
<td>x</td>
</tr>
</tbody>
</table>
Made to Order:
Complete ATEX Solutions from a Single Source.
When selecting Aerzen products you benefit from a complete ATEX-compliant solution from a single source. Our ATEX specialists will design the proper unit for you – including all associated features (see below). The design includes all necessary documentation as well as the accessories to meet the conditions of ATEX Product Directive 94/9/EC. Moreover, our engineers will review and possibly implement further customer requests pertaining to equipment design in view of complying with Directive 94/9/EC (ATEX). In addition to engineering experience based on decades of work with facilities of all different sizes, we offer you, our customer, and a number of other significant advantages:

- comprehensive advice from the AERZEN team of experts
- equipment conforming to Directive 94/9/EC
- complete documentation
- adherence to legal requirements
- complete solutions from a single source

ATEX Solutions from AERZEN: Always an Idea ahead.
Regardless of whether they are to be used for positive or negative pressure applications, high-performance AERZEN equipment will provide you with the right solution for your ATEX zone: TÜV tested, of course. Our technical solutions are determined by product group and zone type. Their features may include:

- zone separation filter
- special documentation
- use of specialized materials for components in contact with the medium
- Ex-instrumentation
- vibration monitoring
- spark arrester
- special motors designed for a specific zone

Example: vacuum pneumatic conveying.
AERZEN zone separation filter:

![Diagram of AERZEN zone separation filter with annotations for Zone 20, Zone 21, and Zone 22]
Explosion Protection in Pneumatic Bulk Material Conveyance.

Flammable or explosive mixtures can occur when pneumatically conveying combustible or flammable bulk materials. For this reason, system components may have to be designated for different zones so that all necessary protective measures can be taken (see illustration).

AERZEN can provide ATEX designs for all system components to ensure explosion protection. According to the ATEX Directive, Zone 21 must provide explosion protection measures even in case of malfunction. This is why the AERZEN safety concept always takes exceptional malfunctions into account.

Depending on the product and plant configuration, bulk materials are transported by means of either positive pressure or vacuum pneumatic conveying. During vacuum operation, it is important to ensure that no flammable dust-air mixtures enter the blower as a result of functional problems of the separator filter (for example filter rupture). An additional filter element (sentinel filter) is usually added in the scope of the plant. This means additional time and expense for design, assembly, and installation.

This is why AERZEN developed a TÜV-tested filter element (sentinel filter or zone separation filter) that is integrated into the intake silencer. The filter is monitored by measuring its pressure drop. A decisive advantage for our customers: they no longer need to include a sentinel or zone separation filter to their scope of supply.

Often overlooked in pneumatic conveying systems is that inadequate maintenance can result in the blower producing sparks that, blown into the conveying pipe (positive pressure conveying), could ignite dust-air mixtures. Organic dust-air mixtures can ignite at temperatures between 200°C and 500°C. During malfunction, sparks can reach temperatures of up to 1,000°C, meaning that serious damage cannot be ruled out. A spark arrester integrated into the pressure-side silencer/base support prevents sparks caused by malfunction from reaching the hazardous zone. Spark arresters are no longer necessary – another decisive advantage for the customer. Retroactive certification of the spark arresters for previously delivered units can be provided under certain conditions.

Example: schematic of a positive pressure conveying system.

AERZEN spark arrester:

Advantages of the integrated AERZEN solution:

• savings for the customer
• maintenance-free (spark arrester)
• minimal pressure loss
• energy-efficient
• compact
• discharge silencers free of absorption material
• 100% safe

* Plant-side spark arresters are not necessary if AERZEN blowers and compressors are used
The following components can be designed for specific ATEX zones:

- drive motor
- belt drive
- instrumentation, including pressure differential, vibration, and temperature monitoring
- housing materials
- suction-side components (filter silencer, sentinel or zone-separation filter)

- additional labeling, operation manuals and declaration of conformity in accordance with Directive 94/9/EC
- discharge silencer as spark arrester
- additional component used on compressors: coupling
That “Something more” When It Comes to Safety: 
Our ATEX Expertise.
AERZEN is one of the world’s oldest and most important producers of rotary lobe blowers, rotary lobe compressors, screw compressors, and turbo blowers. Our company is renowned for its innovations, and is the undisputed market leader in many applications. In over 40 affiliates around the world and with more than 2,000 employees, we put our experience to work on constantly improving compressor and blower technologies. Our technical competence and the ongoing dialog with customers form the foundation on which AERZEN’s intelligent and successful products are built. Solutions that constantly set new standards for energy efficiency, performance and quality, and that meet constantly changing regulations – with post-sales service available all around the world. Challenge us!